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extension and impenetrability—the qualities of touch—disappear along with color and odor, gone perhaps to look for the hole in the cookie after the cookie has been eaten.

From these premises Dr. Wagner considers himself entitled to conclude that the atom and the ether are pure mythological entities. But here he certainly moves too fast. That the atom does not exist in the sense in which materialism supposes it does may well be conceded, but, though essentially intangible and invisible, the question whether it may not exist in the same sense in which the flower that is “born to blush unseen” may be said to be a reality, is another problem—one to be decided by a study of evidence which lies entirely outside of the province of the metaphysician as such to discuss. As well might he have dogmatized about the formation of crystals from solutions before Leuwenhoek turned his microscope upon them, or about the cause of tuberculosis while Koch was still experimenting with staining fluids.

In our use of the word “cause” we have laid ourselves open to another criticism which our author directs against the atomic theory. The only efficient causes, he tells us, are the forces that lie behind phenomena; and, therefore, to talk of the atom or the ether as active agents in the production of change is an absurdity. In one sense this is true enough, but as a criticism upon the use of these terms by a scientist who knows his business, it is irrelevant. The invisible water in the form of steam, in the cylinder of the engine, is just as truly an agent capable of doing work as is the visible water that turns a mill wheel. Perhaps in all strictness we ought to speak rather of the unknown forces that lie behind the steam, as the true agent; if so we must revise in a corresponding manner our everyday language about the mill stream.

It will be seen that Dr. Wagner's book, clearly and convincingly as it has stated some fundamental truths, is a horrible example of the confusion of the scientific and the metaphysical problems raised by the world of nature. But he is not the first. His immediate predecessor in this line is the illustrious Professor Ostwald, who seems to think he has found in idealism a weapon with which to destroy a theory which he himself has probably rejected on other grounds. And then there are the “scientific materialists.” Mistaking the atom for a metaphysical entity they suppose themselves in possession of the clue to the nature of ultimate reality. Reviling all metaphysics, they themselves have swallowed whole one of the shallowest and most dogmatic of metaphysical systems—a spectacle which would certainly be one of the most amusing in the history of thought, if it were not at the same time one of the most mournful.—FRANK CHAPMAN SHARP.

Lessons with plants.

ANOTHER BOOK comes to us from the pen of Professor L. H. Bailey, which is likely to be highly acceptable to the constituency to which it is

addressed. It is not "a botany," as announcements had led us to expect, but, as its title page informs us, a book of "suggestions for seeing and interpreting some of the common forms of vegetation."⁷ Those who have seen the teachers' leaflets for nature study, which are being issued under Professor Bailey's direction by Cornell University, have already a fair sample of what this book is in its spirit; indeed, some of these leaflets reappear in the book with only slight adaptation. Perhaps it will not be too much to say that this book is part of Professor Bailey's crusade against the formal dry-as-dust teaching of botany, in which every live teacher wishes him God-speed.

The methods which are suggested to teacher and pupil herein are the proper ones, beyond question; there are no others which can be called teaching. The preface at least we would have every teacher read and ponder; it is rich in pedagogical suggestions, not so new, perhaps, as forceful. The program there laid down is executed in the following pages in most admirable fashion, where, by suggestive questions and hints, the user is led to right interpretations of many familiar objects in the plant world. Accompanying these interpretations are paragraphs in smaller type containing information upon the more formal aspects of the subjects studied; which leads the author into the statement that, as a last resort, "the pupil may recite from the book, for enough of formal statement and definition may have crept into the work to enable it to be used as a simple text-book." But its main purpose is to suggest methods of nature study, "and since the author cannot bring the plants with him he brings good pictures, which are the next best things." These are indeed admirable; fresh, accurate, and rendered with a high degree of artistic feeling. Professor Holdsworth may well be ranked with Sprague and Faxon as a botanical artist of the first quality. Only once, as far as we see in this book, has he failed to interpret in lines what he has seen; figure 321 is quite inaccurate.

It seems almost captious to say anything in unfavorable criticism of a book in which so much is excellent. It is because the methods suggested are so good that we wish there had been more about the neglected lower plants which are quite as common as the flowering ones which the author uses. True, two lessons are devoted to the cryptogams. But will youngsters be any less interested in the green scums, the gray lichens, the matted mosses, the curious puffballs, than in diclinous flowers, to which three lessons are given? Are not these just as common as the commonest seed plant? And would not the formal statement and definition, which might creep in about these, keep things balanced a little better than to encourage the idea that the

⁷ BAILEY, L. H.—Lessons with plants; suggestions for seeing and interpreting some of the common forms of vegetation; with delineations from nature by W. S. Holdsworth, assistant professor of drawing in the Agricultural College of Michigan. 12mo. pp. xxxii + 491. *figs. 446*. New York: The Macmillan Co. 1898. \$1.10.

flower is the important organ, that seed plants are the *real* plants, and ferns, mosses, and toadstools very much of a side issue?

And then we *do* wish that the pernicious comparison of spores and seeds had not been perpetuated. If Professor Bailey had been condemned for ten years to eradicate from elementary pupils' minds the idea that a seed when it germinates produces a new plant, and to inculcate a true idea of the relation between seed and spore, he would thoroughly appreciate this desire.—C. R. B.

An organography of the higher plants.

A WELCOME BOOK is the recently published treatise on the general organography of plants by Professor Dr. Goebel of Munich.⁸ No one who has given attention to the shifting of the point of view of progressive morphologists can fail to observe that the problems in this field are now seen in an entirely new light. No longer is there presented to the student the conception of an ideal leaf or flower, from which, as from a "pattern," those he observes show "deviations" more or less marked, for which no conceivable reason is assigned except the production of "variety in nature." On the contrary, he is set to study the forms of organs as they exist and to seek in external and internal conditions as they influence hereditary "tendencies" (alas, our ignorance!) the efficient causes for the forms he observes. The old idealistic theory of metamorphosis is giving ground to more realistic views of development as we become able to get closer to the plant. It is plain that modern morphology must base itself upon physiology and ecology.

But these exacter views are as yet in their formative stage, and many who are not specialists are scarcely aware of the departure in current literature from the older standpoint. To these, and to the specialist as well, the gathering together of these newer ideas into a compact discussion will be of great service. The present volume is only the first, or general part, to be followed presumably by a second, treating of special morphology, a work which we hope will not be long delayed, spite of the fragmentary character of the available materials. In order to show the nature of the general part we here translate the principal headings:

Section I. The general segmentation of the plant body: morphology and organography, classification of the organs of seed plants, formation of organs and division of labor among lower plants (thallophytes), normal formation of organs at the growing point and regeneration, coalescence (*Verwachsung*) and dwarfing. *Section II.* Symmetry: positions of organs on radial axes, dorsiventral shoots, symmetry of leaves, symmetry of flowers and inflorescences. *Section III.* Differences in the formation of organs at different stages

⁸ GOEBEL, K.—Organographie der Pflanzen, insbesondere der Archegoniaten und Samenpflanzen. Erster Teil: Allgemeine Organographie. 8vo. pp. x+232. *figs.* 130. Jena: Gustav Fischer. 1898. *M.* 6.